

# US State of the Mobile Union 1H 2020

Carrier performance at nationwide, state, and metro levels,  
plus a look at how 5G is changing your connected experience



The importance of fast and reliable mobile connectivity has never been greater. As our connected communities continue to grow, mobile users expect always-on connectivity and strong network performance anywhere and everywhere they go. As the 5G era in the US continues to expand, demands for a flawless mobile experience will only become more important.

We recently conducted an extensive study of always-on mobile users to understand what consumers truly want from their mobile experience and to learn more about consumer pain points. With fast speeds topping the list of what users want and expect, it wasn't surprising to learn that they're also incredibly excited about the potential of 5G:

### 5G is gaining importance in the US:



believe 5G will ultimately help them or their company make more money.



believe 5G will allow them to share more content on social media.



believe 5G will allow them to work more flexibly from different locations.



believe 5G will significantly reduce travel time and free up more time to be productive.



## Connected insights for your connected lives

Our test results show you how the major operators in the US performed across all the spaces in which you use your smartphone, from the US's 125 most populated metro areas to each of the 50 states, and across the US as whole.

We've also taken a look at how 5G can change (and improve) your daily connected experience in cities across the US. Read on to see how the carriers performed in the first half of 2020.

### We tested:



The entire US



The 50 states



The US's 125 biggest metros



### Testing highlights and stats at a glance



2,722,153  
Tests performed



202,923  
Miles driven



125  
Metro areas tested



Over 3000  
Total places visited

In response to the COVID-19 pandemic, RootMetrics temporarily suspended scouting operations starting in March 2020 to ensure the safety of our employees and our communities. In early June, we resumed testing using a modified scouting approach that included extensive safety measures and strict adherence to local and national COVID-19 guidelines and best practices.

To accommodate safety restrictions while still following RootMetrics scientific testing methodologies under the extraordinary circumstances brought about by the COVID-19 pandemic, we suspended indoor test collection when testing restarted in June. This summary report therefore includes indoor results for any market tested in early 2020 and no indoor results for markets tested in June. To ensure the speed interval results for 1H 2020 and 2H 2019 can be fairly compared, we removed indoor test results from the 2H 2019 markets corresponding to the 70 markets tested in June 2020 in which indoor locations were not tested. As a result, some speed interval results for 2H 2019 may not match with those shown in our previous report released in the second half of 2019.

For United States RootScore Awards, all indoor test results were removed in order to provide fair assessment of carrier performance across the nation. In addition, due to our modified testing in 1H 2020, our state-level testing did not include State RootScore Awards, but results from state testing were factored into the broader United States national results. For a complete list of markets with and without indoor results, as well as cities that do and do not have RootScore Awards, please see the appendix.

# Performance across the United States

Providing strong service across the entirety of the US is a tall order. To earn our US RootScore Awards, a carrier needs to offer outstanding performance across all the different spaces where consumers use their smartphones, from cities and towns of all sizes, to roadways, rural areas, and all the places in between.

Note that with all four major US carriers now having deployed 5G, 1H 2020 marks the first test period in which we're including 5G results (where available) in our testing, and it's also the first time we've used 5G-enabled devices to measure performance on both 4G LTE and 5G.

## Key takeaways

**AT&T takes home the United States Network Speed RootScore Award.** With fast speeds across the board, AT&T pulled away from Verizon to win the US Network Speed RootScore Award. The story here is one of speed consistency across all testing: AT&T delivered fast speeds not only within the top 125 metropolitan markets but also during testing beyond the metro level. Indeed, at a speedy 42.0 Mbps, AT&T clocked the fastest US aggregate median download speed among all networks. AT&T shared the United States Text RootScore Award with Sprint and Verizon.

**Sprint improves in five categories at the national level and earns a share of the US Text RootScore Award.** Sprint shared the US Text RootScore Award with AT&T and Verizon and showed strong improvement in our national testing results. Sprint increased its rank in five categories in 1H 2020 and didn't place fourth in any category (Sprint ranked fourth in five categories last time). While Sprint's network was largely being absorbed by T-Mobile due to the merger, Sprint offered strong results in national testing in several categories. Note that Sprint's 5G performance was tested prior to its 5G network being shut off by T-Mobile in June. Therefore, Sprint 5G results from our testing in June are not indicative of current 5G performance.

**T-Mobile delivers strong text results but ranks fourth in six categories.** T-Mobile typically performs much better in metropolitan markets than it does at the national level, and that remained the case in 1H 2020. That said, T-Mobile's US Text RootScore of 90.0 was strong, and with T-Mobile continuing to roll out its already widespread 5G network, we should see better results outside of major metropolitan cities going forward.

**Verizon continues to be the carrier to beat in the US.** Verizon continued its run of excellence in our national testing, winning or sharing six out of seven awards. In addition to excellent speeds in metros, Verizon recorded a median download speed of 36.0 Mbps at the national level. Adding to its record-setting performance streak, Verizon won United States RootScore Awards outright in the categories of overall performance, network reliability, data performance, and call performance for the fourteenth straight time. Verizon also earned distinction for winning our new US Network Accessibility RootScore Award outright.

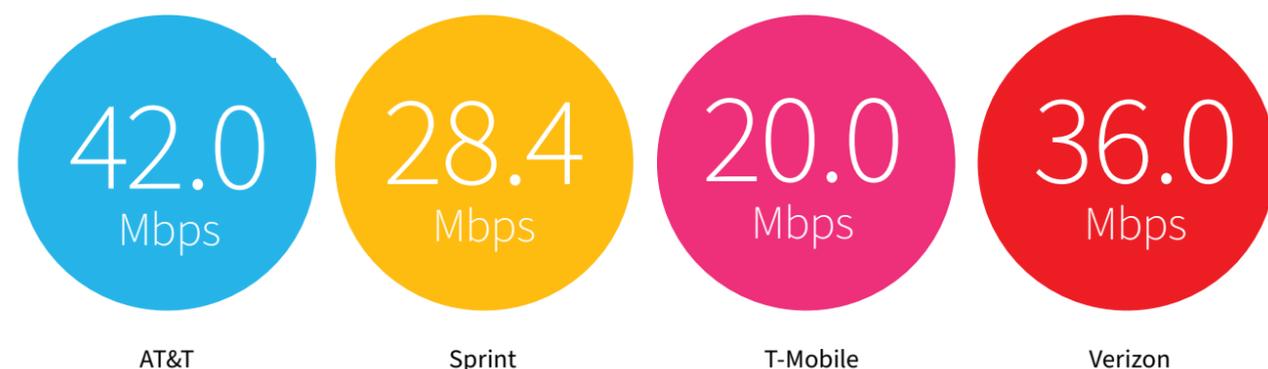
## United States RootScores 1H 2020

| Rank | Overall    | Reliability | Accessibility* | Speed*     | Data       | Call       | Text             |
|------|------------|-------------|----------------|------------|------------|------------|------------------|
| 1    | 95.2       | 95.9        | 93.9           | 95.4       | 96.2       | 93.7       | 96.6, 96.5, 96.2 |
| 2    | 94.1       | 94.5        | 92.1           | 94.3       | 95.7       | 92.0       | 96.6, 96.5, 96.2 |
| 3    | 88.7, 86.7 | 90.3, 88.0  | 89.9           | 82.0, 81.6 | 89.8, 89.1 | 84.5, 81.2 | 96.6, 96.5, 96.2 |
| 4    | 88.7, 86.7 | 90.3, 88.0  | 89.7           | 82.0, 81.6 | 89.8, 89.1 | 84.5, 81.2 | 90.0             |

Note:  
 - Our Accessibility RootScore Award was first introduced in 1H 2020.  
 - To reflect shifting end-user expectations and performance, we've fine-tuned the way we measure network speed. As a result, Network Speed scores are not comparable to 2019 or earlier. See page 11 for more details.

● AT&T ● Sprint ● T-Mobile ● Verizon

## United States speeds (ordered alphabetically)



The speeds above show each carrier's aggregate median download speed across the entirety of the US.

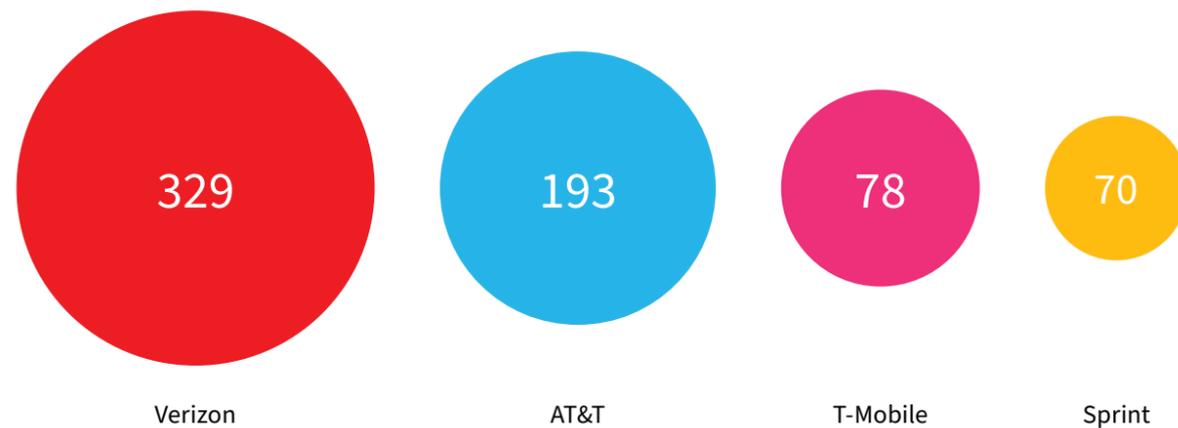
Keep in mind that if a carrier's ranking(s) declines in a given test period, it doesn't necessarily mean that the operator's performance was worse compared to the previous test period. Rather, a strong performance from another operator(s) can correspond with lower rankings for others.

# Metro area performance

Major metropolitan markets are much more than just city centers. They also include the suburbs, business districts, tourist areas, and the roadways that connect them. With the 5G era having started in the US, end users expect fast and reliable mobile performance across all of these spaces, whether they live and work in a metropolitan market or are visiting on vacation.

This section of our report provides a carrier-by-carrier overview of performance across the 125 most populated metro areas in the US, as well as a high-level look at how each carrier's 5G network has performed as deployments continue.

## Metro Area RootScore Award tally (55 cities)



Note that because of changes in our scouting due to the COVID-19 pandemic, 55 of the 125 metropolitan markets we tested in the US have RootScore Award winners, while the other 70 do not. Therefore, this tally of awards factors in awards from 55 cities. For a list of the cities that do (and do not) have RootScore Awards, see the appendix.

## Metro performance in a nutshell:

**AT&T** performed well in our metro area testing, recording fast speeds, strong reliability, and the second-highest award count among all carriers.

**Sprint** delivered strong text results, sharing the Text RootScore Award in 53 out of 55 cities.

**T-Mobile's** best performance came in the text category, with the carrier sharing 43 Text RootScore Awards out of 55 cities. T-Mobile also had strong speeds in many markets, registering median download speeds of at least 20 Mbps in 67 metros and speeds above 30 Mbps in 24 of those cities.

**Verizon** remained the top performer at the metro level, with fast speeds, excellent reliability, and by far the highest tally of RootScore Awards among all carriers.



# AT&T provides fast speeds, excellent reliability, and the second-highest award total.

**Good news for AT&T subscribers looking for fast speeds:** AT&T outperformed all other carriers when looking at top-end speeds. In fact, AT&T delivered median download speeds of at least 40 Mbps in more markets (67) than any other carrier in 1H 2020, with speeds faster than 50 Mbps in 42 of those metros. Even more impressive is that AT&T registered median download speeds over 50 Mbps in 33 more markets than it did in 2H 2019. But AT&T wasn't just fast at the top end; its network also had only eight markets with speeds under 20 Mbps.

**Extremely fast in Fayetteville, NC:** As another mark of its notable speed performance in the first half of 2020, AT&T delivered the single fastest median download speed we recorded for any carrier—83.7 Mbps in Fayetteville, NC.

**AT&T registers excellent reliability, call, and text results:** AT&T's reliability results were strong across the board. AT&T reached our mark of "Excellent" data reliability (success rates of at least 97% for both getting connected and staying connected) in nearly every city we tested and won 20 Reliability RootScore Awards (second to category leader Verizon's total of 54). Among the 55 cities that had RootScore Awards in 1H 2020, AT&T shared the Text RootScore Award in 53 of those markets. AT&T also won or shared our Call RootScore Award in 38 out of 55 cities, and the carrier's improved speed results led to AT&T earning 30 Network Speed RootScore Awards, a total topped by only Verizon. AT&T's total metro award count of 193 was the second-highest of all carriers.

**AT&T offers broad 5G footprint:** We recorded 5G results for AT&T in 78 metros, second only to T-Mobile's 112. With a broad range of spectrum assets and a strong 4G LTE network as a foundation, AT&T's 5G network has shown impressive improvement over a short period of time.

## AT&T's median download speed intervals (all network technologies)

| Median download speed intervals | 0-10 Mbps | 10-20 Mbps | 20-30 Mbps | 30-40 Mbps | 40-50 Mbps | 50+ Mbps |
|---------------------------------|-----------|------------|------------|------------|------------|----------|
| 2H 2019                         | 1         | 13         | 38         | 36         | 28         | 9        |
| 1H 2020                         | 0         | 8          | 22         | 28         | 25         | 42       |

- Number of markets out of 125 in which AT&T delivered median download speeds at various intervals.
- Median download speeds from 1H 2020 represent speeds on all network technologies, including 5G, where available.
- Speeds from 2H 2019 did not include 5G results.



## AT&T's fastest and slowest median download speeds

(and how long it takes to download a 5MB song)



Speeds above show the markets in which AT&T recorded its fastest and slowest median download speeds (Mbps), and the times indicate how long it typically takes to download a 5MB song at each speed (times in seconds).

## AT&T Metro Area RootScore Award tally (55 cities)

|                               | AT&T | Outright  | Ties       | 1H 2020 total |
|-------------------------------|------|-----------|------------|---------------|
| Overall RootScore Award       |      | 3         | 19         | 22            |
| Reliability RootScore Award   |      | 1         | 19         | 20            |
| Accessibility RootScore Award |      | 6         | 11         | 17            |
| Speed RootScore Award         |      | 10        | 20         | 30            |
| Data RootScore Award          |      | 7         | 6          | 13            |
| Call RootScore Award          |      | 2         | 36         | 38            |
| Text RootScore Award          |      | 0         | 53         | 53            |
| <b>Total awards</b>           |      | <b>29</b> | <b>164</b> | <b>193</b>    |

Note that this award tally factors in awards from 55 out of 125 cities tested. For a list of the cities that do (and do not) have RootScore Awards, see the appendix.

# Sprint shows impressive text results, moderate speed gains, and strong 5G speeds.

**Excellent text performance across the board:** Sprint shared the Text RootScore Award in 53 of 55 markets, delivering impressive text performance in general.

**Speeds show high-end speed improvement:** Sprint increased the number of markets in which it delivered median download speeds of at least 40 Mbps from 6 in 2H 2019 to 27 in 1H 2020. Sprint also registered median download speeds of at least 50 Mbps in six cities, a jump from zero such markets last time.

**Strong data reliability and dropped call rates:** Sprint performed well in our data reliability testing, recording outstanding reliability for both getting connected and staying connected in nearly every city we tested in 1H 2020. Sprint also reached our mark of “Excellent” dropped call reliability (call failure rates below 2%) in 124 out of 125 markets. While Sprint’s blocked call rates were relatively high in some cities, Sprint’s reliability in general was strong.

**Sprint’s mid-band 5G spectrum holdings help solidify merger with T-Mobile:**

A merger between Sprint and T-Mobile was finalized in April 2020, leaving most of 1H 2020 a transitional period for the Sprint network. Sprint’s mid-band 5G assets were a key reason behind the merger. Mid-band spectrum is often considered the most desirable type of spectrum as it offers advantages of both low-band and mmWave spectrum, with fast speeds and broad geographical coverage. Sprint’s mid-band 5G assets are expected to bring a major boost to T-Mobile 5G performance in the future. Note that Sprint’s 5G performance was tested prior to its 5G network being shut off by T-Mobile in June. Therefore, Sprint 5G results from our testing in June are not indicative of current 5G performance.

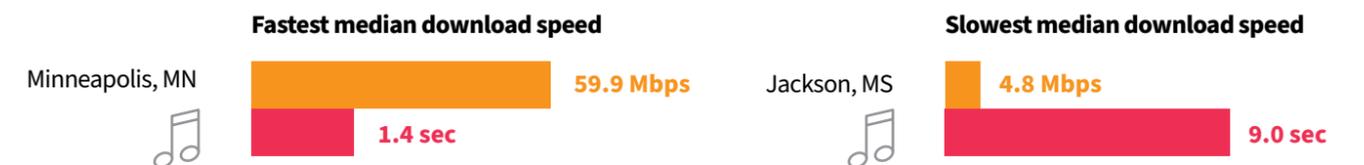
| Sprint’s median download speed intervals (all network technologies) |           |            |            |            |            |          |
|---|-----------|------------|------------|------------|------------|----------|
| Median download speed intervals                                     | 0-10 Mbps | 10-20 Mbps | 20-30 Mbps | 30-40 Mbps | 40-50 Mbps | 50+ Mbps |
| 2H 2019   | 3         | 31         | 46         | 39         | 6          | 0        |
| 1H 2020   | 2         | 25         | 35         | 36         | 21         | 6        |

- Number of markets out of 125 in which Sprint delivered median download speeds at various intervals.
- Median download speeds from 1H 2020 represent speeds on all network technologies, including 5G, where available.
- Speeds from 2H 2019 did not include 5G results.



**Sprint’s fastest and slowest median download speeds**

(and how long it takes to download a 5MB song)



Speeds above show the markets in which Sprint recorded its fastest and slowest median download speeds (Mbps), and the times indicate how long it typically takes to download a 5MB song at each speed (times in seconds).

**Sprint Metro Area RootScore Award tally (55 cities)**

| Sprint                        | Outright | Ties      | 1H 2020 total |
|-------------------------------|----------|-----------|---------------|
| Overall RootScore Award       | 0        | 0         | 0             |
| Reliability RootScore Award   | 0        | 3         | 3             |
| Accessibility RootScore Award | 0        | 3         | 3             |
| Speed RootScore Award         | 0        | 1         | 1             |
| Data RootScore Award          | 0        | 1         | 1             |
| Call RootScore Award          | 0        | 9         | 9             |
| Text RootScore Award          | 0        | 53        | 53            |
| <b>Total awards</b>           | <b>0</b> | <b>70</b> | <b>70</b>     |

Note that this award tally factors in awards from 55 out of 125 cities tested. For a list of the cities that do (and do not) have RootScore Awards, see the appendix.

# T-Mobile delivers solid text and reliability results.

**Good data reliability, with mixed call performance:** While T-Mobile delivered good data reliability results in most cities, the carrier's blocked call rates were relatively high in several markets. That said, T-Mobile's dropped call results were quite strong in nearly every market we visited.

**Solid text performance:** Among the 55 cities with RootScore Awards in 1H 2020, T-Mobile shared the Text RootScore Award in 43 of those markets, which accounts for the majority of T-Mobile's RootScore Award wins this test period.

**Excellent speeds in several metros:** T-Mobile typically clocks fast speeds in metropolitan markets, and that was again the case in 1H 2020. While T-Mobile didn't register median download speeds faster than 40 Mbps in as many markets as the other carriers, T-Mobile still delivered speeds of at least 20 Mbps in 67 cities in this test period. In many ways, the first half of 2020 could be seen as a transitional period, with work being done that could enable a big jump in performance for T-Mobile customers moving forward.

**5G performance expected to boom thanks to Sprint merger:** T-Mobile already has the most widespread 5G network among all carriers, but currently the carrier's 5G speeds are similar to those on 4G LTE. That should change, however, once T-Mobile integrates Sprint's highly coveted mid-band spectrum into its 5G solutions in more and more cities.

## T-Mobile's median download speed intervals (all network technologies)

| Median download speed intervals | 0-10 Mbps | 10-20 Mbps | 20-30 Mbps | 30-40 Mbps | 40-50 Mbps | 50+ Mbps |
|---------------------------------|-----------|------------|------------|------------|------------|----------|
| 2H 2019                         | 3         | 26         | 44         | 40         | 10         | 2        |
| 1H 2020                         | 3         | 55         | 43         | 17         | 7          | 0        |

- Number of markets out of 125 in which T-Mobile delivered median download speeds at various intervals.
- Median download speeds from 1H 2020 represent speeds on all network technologies, including 5G, where available.
- Speeds from 2H 2019 did not include 5G results.



## T-Mobile's fastest and slowest median download speeds (and how long it takes to download a 5MB song)



Speeds above show the markets in which T-Mobile recorded its fastest and slowest median download speeds (Mbps), and the times indicate how long it typically takes to download a 5MB song at each speed (times in seconds).

## T-Mobile Metro Area RootScore Award tally (55 cities)

| T-Mobile                      | Outright | Ties      | 1H 2020 total |
|-------------------------------|----------|-----------|---------------|
| Overall RootScore Award       | 0        | 2         | 2             |
| Reliability RootScore Award   | 0        | 7         | 7             |
| Accessibility RootScore Award | 2        | 2         | 4             |
| Speed RootScore Award         | 2        | 5         | 7             |
| Data RootScore Award          | 3        | 3         | 6             |
| Call RootScore Award          | 0        | 9         | 9             |
| Text RootScore Award          | 0        | 43        | 43            |
| <b>Total awards</b>           | <b>7</b> | <b>71</b> | <b>78</b>     |

Note that this award tally factors in awards from 55 out of 125 cities tested. For a list of the cities that do (and do not) have RootScore Awards, see the appendix.

# Verizon delivers excellent results across the board: fast speeds, excellent reliability, and the highest award total.

**Consistently fast:** Most of the talk about carrier performance right now is on top-end speed. Verizon delivered on that front, registering LTE speeds that often rival the 5G speeds of other carriers. But Verizon is notable for also providing exceptional reliability and having built a network that rarely offers speeds at the slower end for consumers. Verizon won or shared 41 Speed RootScore Awards out of 55 metros in 1H 2020, the most of any carrier this half. Moreover, Verizon’s “slowest” median download speed of 16.1 Mbps, recorded in Sarasota, FL, was still solid and would allow end users to complete the majority of data tasks with ease. In fact, Verizon only registered median download speeds under 20 Mbps in two markets, the fewest of any carrier.

**Excellent reliability across the board:** While speed is important, it’s not everything. Verizon also offered outstanding reliability, earning by far the highest tally of Network Reliability RootScore Awards among all carriers at 54. Verizon’s data reliability was particularly strong, with the carrier reaching our mark of Excellent data reliability for getting connected in 124 cities while achieving Excellence for staying connected in all 125 markets.

**By far the most awards:** Verizon earned an exceptional 329 RootScore Awards this half out of 385 opportunities and won or shared the new Accessibility RootScore Award in 45 out of 55 metros. Verizon also won or shared the Overall RootScore Award in 52 metros and the Reliability Award in 54 metros.

**Verizon’s 5G is fast:** We recorded results on Verizon’s millimeter wave (mmWave) 5G network in 27 cities in 1H 2020, and its speeds were outstanding. While the availability of Verizon’s mmWave 5G is currently targeted to densely populated areas of various cities where greater capacity can help enhance service, the carrier’s 4G LTE network has continued to deliver outstanding results, so Verizon users should experience fast speeds and strong performance regardless of network technology.

## Verizon’s median download speed intervals (all network technologies)

| Median download speed intervals | 0-10 Mbps | 10-20 Mbps | 20-30 Mbps | 30-40 Mbps | 40-50 Mbps | 50+ Mbps |
|---------------------------------|-----------|------------|------------|------------|------------|----------|
| 2H 2019                         | 0         | 1          | 32         | 65         | 20         | 7        |
| 1H 2020                         | 0         | 2          | 15         | 57         | 39         | 12       |

- Number of markets out of 125 in which Verizon delivered median download speeds at various intervals.
- Median download speeds from 1H 2020 represent speeds on all network technologies, including 5G, where available.
- Speeds from 2H 2019 did not include 5G results.



## Verizon’s fastest and slowest median download speeds

(and how long it takes to download a 5MB song)



Speeds above show the markets in which Verizon recorded its fastest and slowest median download speeds (Mbps), and the times indicate how long it typically takes to download a 5MB song at each speed (times in seconds).

## Verizon Metro Area RootScore Award tally (55 cities)

| Verizon                       | Outright   | Ties       | 1H 2020 total |
|-------------------------------|------------|------------|---------------|
| Overall RootScore Award       | 31         | 21         | 52            |
| Reliability RootScore Award   | 30         | 24         | 54            |
| Accessibility RootScore Award | 33         | 12         | 45            |
| Speed RootScore Award         | 22         | 19         | 41            |
| Data RootScore Award          | 36         | 8          | 44            |
| Call RootScore Award          | 14         | 39         | 53            |
| Text RootScore Award          | 0          | 40         | 40            |
| <b>Total awards</b>           | <b>166</b> | <b>163</b> | <b>329</b>    |

Note that this award tally factors in awards from 55 out of 125 cities tested. For a list of the cities that do (and do not) have RootScore Awards, see the appendix.

# Spectrum: the key to understanding 5G

Because of the complexity of spectrum, 5G launches can often lead to confusion. The key to understanding 5G is understanding spectrum—the different types, the advantages of each, and how those spectrum types can work together to deliver an optimal 5G experience. For a deeper look at spectrum, watch our [new spectrum video](#) and read our comprehensive report on [understanding spectrum and 5G](#).

When it comes to spectrum, there is no best, only different.

## Low-band <1 GHz

Travels far and penetrates deep indoors. Can reach rural communities. Works with 5G and 4G LTE. Biggest disadvantage: slower speeds (5G similar to LTE speeds).

## Mid-Band 1-6 GHz

Known as the “sweet spot” for 5G connectivity. Faster than low-band. Works with 5G and 4G LTE. Biggest disadvantage: limited resource for mobile carriers.

## High-Band (mmWave)

Incredibly fast speeds and hotspots of 5G connectivity. Faster than other bands. Works with 5G only. Biggest disadvantage: travels a very short distance.

## 5G spectrum assets in use by carrier:

**AT&T** uses low-band for its 5G network extensively and, after offering mmWave for its enterprise customers, is now expanding use of that spectrum for consumers as well. AT&T is also beginning to use dynamic spectrum sharing (DSS) technology in low-band.

**Sprint** deployed only mid-band spectrum for its 5G network prior to the merger with T-Mobile. Note that Sprint's 5G performance was tested prior to its 5G network being shut off by T-Mobile in June. Therefore, Sprint 5G results from our testing in June are not indicative of current 5G performance.

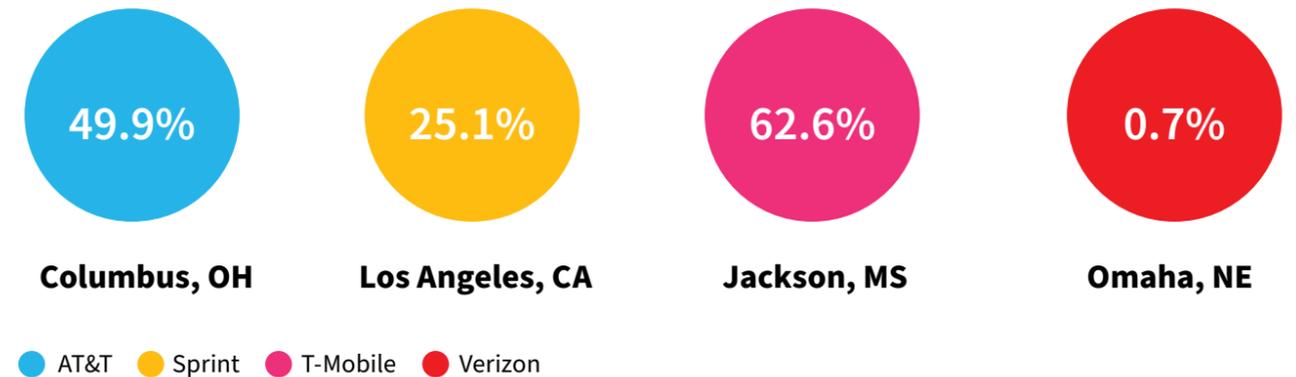
**T-Mobile** deployed low-band and mmWave 5G spectrum prior to the merger with Sprint. T-Mobile now has active deployments in all three spectrum types in its “Layer Cake” 5G strategy.

**Verizon** has actively deployed only mmWave 5G spectrum with plans to expand its 5G network through DSS technology. Verizon’s lower 5G availability doesn’t mean it isn’t active with 5G; rather, it reflects the smaller coverage footprint of mmWave spectrum itself.

## Availability overview

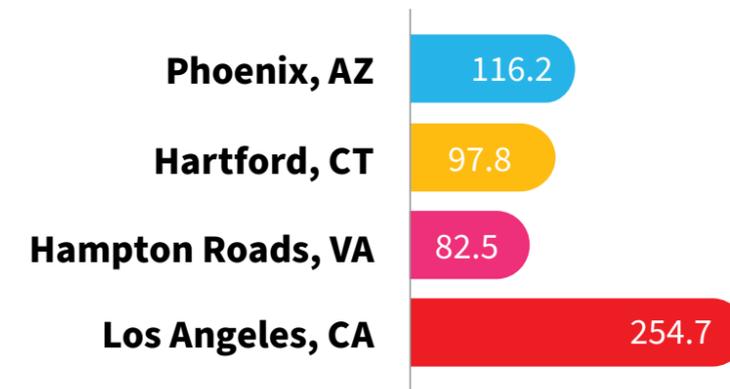
Keep in mind that there are important availability differences based on spectrum types, and carriers face a sometimes-difficult trade-off between broad geographical coverage and fast speeds. A balance of spectrum types is often considered ideal as 5G continues to expand.

## Metro with each carrier's highest availability (%)

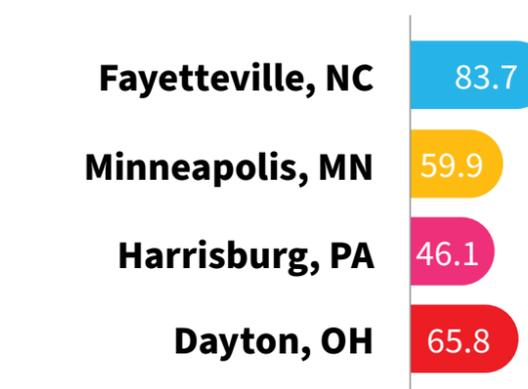


Note: 5G availability is based on the percentage of 5G recorded across all data tests (download, upload, and web and app tests).

## Fastest 5G median download speeds (Mbps) by carrier



## Fastest 4G LTE median download speeds (Mbps) by carrier



● AT&T ● Sprint ● T-Mobile ● Verizon

# How we test

We believe that real-world results come from real-world testing. All RootMetrics testing is conducted from the consumer's point of view. For US national, state, and metro testing in 1H 2020, we used the Samsung Galaxy S10 5G smartphone to test Sprint's network and the Samsung Note 10+ 5G to test the networks of AT&T, T-Mobile, and Verizon. All phones were purchased off the shelf from carrier stores to test both 4G LTE and 5G performance, and tests were conducted during the day and night while walking and driving. Note that in early April, after the Sprint/T-Mobile merger was completed, Sprint's 5G service was only available to Sprint users with a Samsung Galaxy S20 5G smartphone. However, because the Galaxy S20 was not released to the public when we began our 1H 2020 testing, we used a Samsung Galaxy S10 5G to test Sprint's performance in 1H 2020. See our [methodology page](#) to learn about our device benchmarking processes. For more detail about Sprint and 5G devices, read our [recent report](#).

To ensure our results are current and reflect shifting consumer behaviors and emerging technologies, we've made two notable changes to our methodology in 2020. We introduced our new Network Accessibility RootScore Award, which offers a holistic look at accessibility performance across data, call, and text testing and includes latency results during data testing, as well as speed results during call and text testing. We also fine-tuned our Network Speed RootScore category in 2020; we've updated various speed thresholds to capture the most accurate possible picture of when users experience diminishing returns based on changing end-user expectations and performance. As a result, Network Speed RootScores from 2020 cannot be compared to those from 2019 or earlier. To learn more about our testing, visit the [methodology page](#) of our website.

## A note about our 5G results in the US

With all four carriers having launched 5G in the US, 1H 2020 marks the first test period in which we've used 5G-enabled smartphones to test network performance on both 5G and other network technologies, such as 4G LTE or sub-4G LTE. Because 5G users will likely switch from 5G to 4G LTE (or vice versa) during a typical mobile activity, the metrics in this report, unless explicitly stated as 5G or 4G LTE, reflect performance across all network technologies, including 5G where available.

The 5G metrics in this report were collected during our scientific Metro Area RootScore testing across the US's 125 largest metropolitan cities (also known as Census Urbanized Areas or CUAs) as defined by the United States Census Bureau. Our scientific metro area testing is designed to characterize network performance as a whole across an entire metropolitan market. In contrast, during our 5G First Look testing in 2019, we tested 5G performance shortly after some US carriers had launched 5G in Atlanta, Chicago, and Dallas. During that study, tests were largely conducted in known areas of 5G deployment, and a large portion of our tests were done while walking and were concentrated on densely populated city centers in each market, rather than across the entirety of each city. As a result of the differences in testing methodologies, comparisons between 5G results in this report cannot be made to those in our 5G First Look Reports for Atlanta, Chicago, or Dallas.

# Appendix



## Cities with Indoor Results & RootScore Awards

Akron, OH  
Albuquerque, NM  
Allentown, PA  
Ann Arbor, MI  
Antelope Valley, CA  
Austin, TX  
Bakersfield, CA  
Baton Rouge, LA  
Boise, ID  
Buffalo, NY  
Charleston, SC  
Cincinnati, OH  
Cleveland, OH  
Colorado Springs, CO  
Concord, CA  
Dayton, OH  
Denton, TX  
Detroit, MI  
El Paso, TX  
Hartford, CT  
Honolulu, HI  
Jacksonville, FL  
Kissimmee, FL  
Knoxville, TN  
Lancaster, PA  
Las Vegas, NV  
Los Angeles, CA  
Louisville, KY  
Madison, WI  
Milwaukee, WI  
Minneapolis, MN  
Modesto, CA  
Nashville, TN  
Ogden, UT  
Oklahoma City, OK  
Orlando, FL  
Oxnard, CA  
Philadelphia, PA  
Port St. Lucie, FL  
Portland, OR  
Provo, UT  
Raleigh, NC  
Riverside, CA  
Salt Lake City, UT  
San Antonio, TX  
San Jose, CA  
Sarasota, FL  
Scranton, PA  
Spokane, WA  
St. Louis, MO  
Syracuse, NY  
Temecula, CA  
Tucson, AZ  
Tulsa, OK  
Victor Valley, CA



## Cities without Indoor Results & RootScore Awards

Albany, NY  
Atlanta, GA  
Augusta, GA  
Baltimore, MD  
Birmingham, AL  
Bonita Springs, FL  
Boston, MA  
Bridgeport, CT  
Charlotte, NC  
Chattanooga, TN  
Chicago, IL  
Columbia, SC  
Columbus, OH  
Corpus Christi, TX  
Dallas, TX  
Daytona Beach, FL  
Denver, CO  
Des Moines, IA  
Durham, NC  
Fayetteville, NC  
Flint, MI  
Fort Myers, FL  
Fort Wayne, IN  
Fresno, CA  
Grand Rapids, MI  
Greensboro, NC  
Greenville, SC  
Hampton Roads, VA  
Harrisburg, PA  
Houston, TX  
Hudson Valley, NY  
Indianapolis, IN  
Indio, CA  
Jackson, MS  
Kansas City, MO  
Lansing, MI  
Little Rock, AR  
McAllen, TX  
Memphis, TN  
Miami, FL  
Mission Viejo, CA  
Mobile, AL  
New Haven, CT  
New Orleans, LA  
New York, NY  
Omaha, NE  
Palm Bay, FL  
Pensacola, FL  
Phoenix, AZ  
Pittsburgh, PA  
Providence, RI  
Reno, NV  
Richmond, VA  
Rochester, NY  
Rockford, IL  
Sacramento, CA  
San Diego, CA  
San Francisco, CA  
Santa Rosa, CA  
Seattle, WA  
Shreveport, LA  
Springfield, MA  
Stockton, CA  
Tampa, FL  
Toledo, OH  
Washington, DC  
Wichita, KS  
Winston-Salem, NC  
Worcester, MA  
Youngstown, OH



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